# Algebra 1: Linear

## Stage 1 Desired Results

ESTABLISHED GOALS:

*Competencies:*

- ***Students will demonstrate the ability to apply and extend mathematical properties in order to solve problems.***
- ***Students will demonstrate the ability to communicate and justify reasoning in order to support mathematical arguments.***

*Content Standards:*

- N.Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N.Q.2. Define appropriate quantities for the purpose of descriptive modeling.
- N.Q.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- A.CED.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
- A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- A.CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

### *Transfer*

*Students will be able to independently use their learning to **create and evaluate visual models of relationships between variables.***

### *Meaning*

ENDURING UNDERSTANDINGS

*Students will understand that…*

- ratios can be used to show a relationship between changing quantities, such as vertical and horizontal change.
- a line on a graph can be represented by a linear equation.
- the relationship between two lines can be determined by comparing their slopes and y-intercepts.

ESSENTIAL QUESTIONS

- What are relationships that can be modeled as linear functions?
- How do the tools of algebra relate to equations and modeling relationships in graphic or chart form?

### *Acquisition*

*Students will know…*

- that Key features of a graph of a function modeling the relationship of two quantities include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- that a function is a relationship where each input has exactly one output.
- that a linear function is a function with a constant rate of change. On a graph that looks like a line.
- that slope is ratio of the change in y over the chang in x.
- that the y intercept is a point where a function crosses the y axis and it's also where the x = 0.

*Students will be skilled at…*

- using units as a way to understand problems and to guide the solution of multi-step problems.
- choosing and interpreting units consistently in formulas.
- choosing and interpreting the scale and the origin in graphs and data displays.
- defining appropriate quantities for the purpose of descriptive modeling.
- choosing a level of accuracy appropriate to limitations on measurement when reporting quantities.
- creating equations and inequalities in one variable and use them to solve problems. Including equations arising from linear and quadratic functions, and simple rational and exponential functions.

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| ● A.CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.<br>● A.REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.<br>● A.REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. Solve equations and inequalities in one variable<br>● A.REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.<br>● A.REI.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.<br>● A.REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.<br>● A.REI.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).<br>● A.REI.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.<br>● F.IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).<br>● F.IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.<br>● F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch | ● that the x intercept is a point where a function crosses the x axis and it's also where the y = 0.<br>● the difference between expressions and equations.<br>● that slope intercept form of a linear equation is y = mx +b where m is the slope and b is the y intercept.<br>● that standard form of a linear equation is Ax + By =C where A and B are not equal to 0.<br>● that point-slope form of an equation is $y - y_1 = a(x - x_1)$ where a is the slope and $(x_1, y_1)$.<br>● that a system of linear equations is 2 more linear equations.<br>*<u>vocabulary:</u>*<br>equation, expression, inequality, function, linear, intercepts, intervals, slope, slope intercept form, standard form, point-slope form | ● creating equations in two or more variables to represent relationships between quantities.<br>● graphing equations on coordinate axes with labels and scales.<br>● representing constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpreting solutions as viable or nonviable options in a modeling context.<br>● rearranging formulas to highlight a quantity of interest, using the same reasoning as in solving equations.<br>● explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.<br>● constructing a viable argument to justify a solution method.<br>● solving simple rational and radical equations in one variable, and giving examples showing how extraneous solutions may arise.<br>● solving equations and inequalities in one variable<br>● solving linear equations and inequalities in one variable, including equations with coefficients represented by letters.<br>● proving that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.<br>● solving systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.<br>● recognizing that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).<br>● graphing the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graphing the solution set to a system of |

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| graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★<br>● F.IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.<br>● F.IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★<br>● F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★<br>o F.IF.7a. Graph linear functions and show intercepts, maxima, and minima.<br>o F.IF.7b. Graph absolute value functions.<br>● F.IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.<br>o F.IF.8a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.<br>● F.BF.1. Write a function that describes a relationship between two quantities.★<br>o F.BF.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.<br>● F.LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.<br>o F.LE.1a. Prove that linear functions grow by equal differences over equal intervals.<br>o F.LE.1b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.<br>● F.LE.2. Construct linear functions, including arithmetic and geometric sequences, given a graph, a description | | linear inequalities in two variables as the intersection of the corresponding half-planes.<br>● recognizing that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).<br>● using function notation, evaluating functions for inputs in their domains, and interpreting statements that use function notation in terms of a context.<br>● For a function that models a relationship between two quantities, interpreting key features of graphs and tables in terms of the quantities, and sketching graphs showing key features given a verbal description of the relationship.<br>● relating the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.<br>● calculating and interpreting the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.<br>● graphing linear functions and show intercepts, maxima, and minima.<br>● graphing absolute value functions.<br>● using the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpreting these in terms of a context.<br>● writing a function that describes a relationship between two quantities.<br>● determining an explicit expression, a recursive process, or steps for calculation from a context.<br>● distinguishing between situations that can be modeled with linear functions and with exponential functions. |

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| of a relationship, or two input-output pairs (include reading these from a table).<br>● F.LE.5. Interpret the parameters in a linear or exponential function in terms of a context. | | ● proving that linear functions grow by equal differences over equal intervals.<br>● recognizing situations in which one quantity changes at a constant rate per unit interval relative to another.<br>● constructing linear functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).<br>● interpreting the parameters in a linear or exponential function in terms of a context. |
| ***Content Area Literacy Standards*** | | ***21st Century Skills*** |
| ● RH 9-10.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.<br>● RST 9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context<br>● RST. 9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.<br>● WHST.9-10.1 Write arguments focused on *discipline-specific content*.<br>● WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | | ● ***Use Systems Thinking***<br>● ***Solve Problems***<br>● ***Reason Effectively*** |

# Algebra 1 Unit 2: Exponential

## Stage 1 Desired Results

ESTABLISHED GOALS:

*Competencies:*

- ***Students will demonstrate the ability to apply and extend mathematical properties in order to solve problems.***
- ***Students will demonstrate the ability to communicate and justify reasoning in order to support mathematical arguments.***

*Content Standards:*

- N.RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
- N.RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- N.RN.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
- A.SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
  - A.SSE.3c. Use the properties of exponents to transform expressions for exponential functions.
- F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
  - F.IF.7e. Graph exponential functions, showing intercepts and end behavior.

### *Transfer*

*Students will be able to independently use their learning to* ***recognize and differentiate between linear and non-linear relationships.***

### *Meaning*

ENDURING UNDERSTANDINGS

*Students will understand that…*

- exponents are used to represent complex expressions.
- linear functions have a constant difference, whereas exponential functions have a constant ratio.
- real world situations can be represented symbolically and graphically.

ESSENTIAL QUESTIONS

- What characterizes exponential growth and decay?
- What are real world models of exponential growth and decay?

### *Acquisition*

*Students will know…*

- that exponential functions are non-linear.
- the basic form of the exponential function is $f(x)=ab^x$
- the use of zero and negative exponents.
- the use of the properties of exponents.
- the compound interest formula.
- the steps to solve exponential equations.
- the relationship between exponential functions and their graphs.
- that they can make predictions using exponential functions.
- that there is a relationship between exponential and radical expressions.
- that there is a relationship between tables, graphs, functions and exponential functions.
- that given a table, graph, function it can be determined whether a function is linear, exponential or neither.
- that exponential functions can be graphed on the coordinate grid.

*Students will be skilled at…*

- explaining how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
- rewriting expressions involving radicals and rational exponents using the properties of exponents.
- explaining why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.
- choosing and producing an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
- using the properties of exponents to transform expressions for exponential functions.

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| ● F.IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.<br>○ F.IF.8b. Use the properties of exponents to interpret expressions for exponential functions.<br>● F.LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.<br>○ F.LE.1a. Prove that exponential functions grow by equal factors over equal intervals.<br>○ F.LE.1c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.<br>● F.LE.2. Construct exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).<br>● F.LE.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. | ● that operations can be performed on exponential expressions with positive, negative, zero or rational exponents.<br>● that b affects the end behavior of the function in $y=ab^x$<br>● that exponential growth and decay functions have characteristics that reveal themselves.<br>● that geometric sequences are related to exponential growth.<br>● that recursive sequences are related to exponential growth.<br><br>**vocabulary:** exponential function, exponent, power, base, scientific notation, non-linear, radical, index of a radial, nth root of a radical, exponential growth, exponential decay, compound interest, geometric sequence, common ratio, recursive sequence, recursive rule, explicit rule | ● graphing functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★<br>● graphing exponential functions, showing intercepts and end behavior.<br>● writing a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.<br>● using the properties of exponents to interpret expressions for exponential functions.<br>● distinguishing between situations that can be modeled with linear functions and with exponential functions.<br>● proving that exponential functions grow by equal factors over equal intervals.<br>● recognizing situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.<br>● constructing exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).<br>● observing using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. |
| ***Content Area Literacy Standards*** | | ***21st Century Skills*** |
| ● RH 9-10.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.<br>● RST 9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context<br>● RST. 9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.<br>● WHST.9-10.1 Write arguments focused on *discipline-specific content*.<br>● WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | | ● ***Use Systems Thinking***<br>● ***Solve Problems***<br>● ***Reason Effectively*** |

# Algebra 1 Unit 3: Quadratics

## Stage 1 Desired Results

ESTABLISHED GOALS:

*Competencies:*

- ***Students will demonstrate the ability to apply and extend mathematical properties in order to solve problems.***
- ***Students will demonstrate the ability to communicate and justify reasoning in order to support mathematical arguments.***

*Content Standards:*

- A.SSE.1. Interpret expressions that represent a quantity in terms of its context.
  - A.SSE.1a. Interpret parts of an expression, such as terms, factors, and coefficients.
  - A.SSE.1b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.
- A.SSE.2. Use the structure of an expression to identify ways to rewrite it. Write expressions in equivalent forms to solve problems
- A.SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
  - A.SSE.3a. Factor a quadratic expression to reveal the zeros of the function it defines.
  - A.SSE.3b. Complete the square in a quadratic expression to reveal the

### *Transfer*

*Students will be able to independently use their learning* ***compare linear, exponential and quadratic relationships and models in financial, scientific and other data.***

### *Meaning*

ENDURING UNDERSTANDINGS

*Students will understand that…*

- quadratic functions are symmetric, non-linear functions.
- quadratic functions have maximum or minimum output values with a maximum of 2 real solutions.
- quadratic functions model financial and physical data.

ESSENTIAL QUESTIONS

- How does understanding how to find the vertex of a quadratic function help in making decisions in real-life applications?

### *Acquisition*

*Students will know…*

- that the Remainder Theorem states: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).
- that the degree of a polynomial is the first term in the polynomial.
- that classifying polynomials is finding the degree of the leading term of a polynomial in standard form.
- that factoring polynomials can done by guess and check and by the ac method. Also some polynomials are not factorable.
- that multiplying polynomials can be done using multiple methods.
- that adding and subtracting polynomials is combining like terms.
- that by using factoring, quadratic equations can be solved.
- that by using the quadratic formula, quadratic equations can be solved.
- that by using complete the square, quadratic equations can be solved.

*Students will be skilled at…*

- interpreting expressions that represent a quantity in terms of its context.
- interpreting parts of an expression, such as terms, factors, and coefficients.
- interpreting complicated expressions by viewing one or more of their parts as a single entity.
- using the structure of an expression to identify ways to rewrite it.
- writing expressions in equivalent forms to solve problems
- choosing and producing an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
- factoring a quadratic expression to reveal the zeros of the function it defines.
- completing the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
- recognizing that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition,

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| maximum or minimum value of the function it defines.<br>● A.APR.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.<br>● A.APR.2. Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).<br>● A.APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.<br>● A.REI.4. Solve quadratic equations in one variable.<br>o A.REI.4a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)2 = q that has the same solutions. Derive the quadratic formula from this form.<br>o A.REI.4b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.<br>● F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.<br>o F.IF.7a. Graph quadratic functions and show intercepts, maxima, and minima.<br>o F.IF.7b. Graph square root functions.<br>o F.IF.7c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.<br>● F.IF.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). | ● that by using square roots, quadratic equations can be solved.<br>● that finding the axis of symmetry, vertex, y-intercept, x-intercepts of quadratic functions allows you to make predictions.<br>● that given a standard form equation, they can graph quadratic functions by using axis of symmetry, vertex and y intercept.<br>● that given the vertex form of an equation, they can graph quadratic functions.<br>● that given the intercept form, they can graph quadratic functions.<br>● that radical expressions can be simplified using rational exponents or using perfect squares.<br>● that being able to compare linear, exponential and quadratic functions will allow them to choose the right model to solve real life problems.<br>● that a difference of squares polynomial can be factored using a^2-b^2 = (a-b)(a+b).<br>● that a perfect square polynomial can be factored using the formula a^2 +2ab +b^2 = (a+b)^2 or<br>● a^2 -2ab +b^2 = (a-b)^2.<br><br>***vocabulary:*** quadratic function, axis of symmetry, vertex, discriminant, greatest common factor, imaginary number, parabola, quadratic formula, standard form, vertex form, zero of a function, roots of a function, reasonable domain and range, average rate of change, completing the square, factoring | subtraction, and multiplication; add, subtract, and multiply polynomials.<br>● knowing and applying the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).<br>● identifying zeros of polynomials when suitable factorizations are available, and using the zeros to construct a rough graph of the function defined by the polynomial.<br>● using the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)2 = q that has the same solutions. Derive the quadratic formula from this form.<br>● solving quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation.<br>● recognizing when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.<br>● graphing functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.<br>● graphing quadratic functions and show intercepts, maxima, and minima.<br>● graphing square root functions.<br>● graphing polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.<br>● comparing properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).<br>● writing a function that describes a relationship between two quantities.<br>● determining an explicit expression, a recursive process, or steps for calculation from a context. |

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| ● F.BF.1. Write a function that describes a relationship between two quantities.<br>○ F.BF.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context. | | |
| ***Content Area Literacy Standards*** | | ***21st Century Skills*** |
| ● RH 9-10.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.<br>● RST 9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context<br>● RST. 9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.<br>● WHST.9-10.1 Write arguments focused on *discipline-specific content*.<br>● WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | | ● ***Use Systems Thinking***<br>● ***Solve Problems***<br>● ***Reason Effectively*** |

# Algebra 1 Unit 4: Data

## Stage 1 Desired Results

ESTABLISHED GOALS:

*Competencies:*

- ***Students will demonstrate the ability to apply and extend mathematical properties in order to solve problems.***
- ***Students will demonstrate the ability to communicate and justify reasoning in order to support mathematical arguments.***

*Content Standards:*

- S.ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).
- S.ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
- S.ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- S.ID.6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
    - S.ID.6a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
    - S.ID.6b. Informally assess the fit of a function by plotting and analyzing residuals.

### *Transfer*

*Students will be able to independently use their learning to **evaluate and display data to help make decisions.***

### *Meaning*

ENDURING UNDERSTANDINGS

***Students will understand that…***

- Data properly analyzed can help people make better decisions.
- Data clearly and properly displayed can help people communicate something about the world.
- Data displays can be used to inform as well as mislead.

ESSENTIAL QUESTIONS

- How can analysis and displays of data help people make decisions?

### *Acquisition*

*Students will know…*

- that center that measures of center represent the center or typical value of a data set.
- that mean is a measure of center that is the sum of the data divided by the number of data values.
- that median is a measure of center that is the middle number when the values are written in numerical order.
- that mode is a measure of center that is the value that occurs the most in the data set.
- that an outlier is a data value is far outside the other data values in the set.
- that a measure of variation describes the spread of the data set.
- that range is a measure of variation that is the difference between the smallest and largest data values in the set.
- that standard deviation is a measure of how much a typical data value differs from the mean.

*Students will be skilled at…*

- representing data with plots on the real number line (dot plots, histograms, and box plots).
- using statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
- interpreting differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- representing data on two quantitative variables on a scatter plot, and describe how the variables are related.
- fitting a function to the data; using functions fitted to data to solve problems in the context of the data.
- using given functions or choosing a function suggested by the context.

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| ○ S.ID.6c. Fit a linear function for a scatter plot that suggests a linear association.<br>● S.ID.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.<br>● S.ID.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.<br>● S.ID.9. Distinguish between correlation and causation. | ● that a box and whisker plot shows the variability of a data set along the greatest and smallest values as well as the quartiles.<br>● that quartiles divide the data set into four equal parts.<br>● that a five number summary is the five numbers that make up the box and whisker plot<br>● that interquartile range is the difference between the first and third quartile.<br>● that a two way table is a frequency table that displays data collected from one source that belong to two different categories.<br>● that it's important to choose the data display that best represents the data.<br>● that some data displays are misleading and it's important to learn to recognize the difference between a display that is misleading and one that is not.<br>*vocabulary:* measure of center, mean, median, mode, outlier, measure of variation, range, standard deviation, box-and-whisker plot, quartile, five-number summary, interquartile range, two way table, qualitative data, quantitative data, misleading graphs or displays | ● emphasizing linear, quadratic, and exponential models.<br>● informally assessing the fit of a function by plotting and analyzing residuals.<br>● fitting a linear function for a scatter plot that suggests a linear association.<br>● interpreting the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.<br>● computing (using technology) and interpreting the correlation coefficient of a linear fit.<br>● distinguishing between correlation and causation. |
| ***Content Area Literacy Standards*** | | ***21st Century Skills*** |
| ● RH 9-10.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.<br>● RST 9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context<br>● RST. 9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.<br>● WHST.9-10.1 Write arguments focused on *discipline-specific content*.<br>● WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | | ● ***Use Systems Thinking***<br>● ***Solve Problems***<br>● ***Reason Effectively*** |